INSTRUCTION BOOK

MODEL 1010

COMPARISON AND LIMIT BRIDGE

FREED TRANSFORMER CO. INC.

INSTRUMENT DIVISION

MP MASTER

MA34244

INSTRUCTION BOOK

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COMPARISON AND LIMIT BRIDGE

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I N S T R U C T I O N S

FREED COMPARISON AND LIMIT BRIDGE #1010

USES:

This instrument is a comparison and limit bridge for use in both laboratory and production testing of resistors, condensers and inductors. The manufacturer of these components can use it for production tests, the user for incoming inspection and acceptance tests. The instrument is particularly useful for laboratory work (bridge or filters) where very accurate components are required.

DESCRIPTION:

The instrument is composed of an oscillator, a bridge and an amplifier. The oscillator feeds the frequencies into a bridge consisting 2 fixed resistors, the unknown impedance and the standard. A variable resistor connected between the 2 fixed resistors makes it possible to read the percentage difference between the unknown and the standard, on a specially calibrated dial. A high gain amplifier indicates the balance of the bridge. The general method of testing is the comparison of an unknown component with a standard component of the same type. Accurate percentage measurements are obtained by the use of precision components in the arms of the bridge. The use of high gain amplifier and adequate internal shielding assures a very sharp distinct balance.

A visual null indicator, consisting of a meter used in connection with the high gain amplifier makes it possible to use the No. 1010 Bridge as a precision limit bridge in production testing.

FEATURES:

For precision and production testing, the bridge has many advantages. Power line operation and the visual indicator make the instrument completely self-contained. It can be used in noisy locations. Its small size and light weight permit the instrument to be moved easily and to be set up wherever necessary.

S P E C I F I C A T I O N S

FREQUENCY: Three frequencies are available; 50 to 60 cycles, 1000 cycles and 10,000 cycles.
The 50 or 60 cycles are taken from the line.
The 1000 and 10,000 cycles are generated by an oscillator and are accurate to within 10%.

RANGE: Two comparison ranges are provided: 10% and 20%. They are selected by a rotary switch. In the 10% position the percentage is read directly on a calibrated dial. In the 20% position the reading of the dial is multiplied by two.

RESISTOR MEASUREMENTS: Resistors from 10 ohms up to 1 megohms are measured by the comparison method at 60 cycles. Resistors of greater value than 1 megohm can be measured by using the instrument as a limit bridge.

CONDENSER MEASUREMENTS: Condensers from 500 micromicrofarads up to 10 microfarads are measured by the comparison method at 1000 cycles. Condensers above 10 microfarads are measured by the comparison method at 60 cycles.
Small condensers 500 micromicrofarads to 25 micromicrofarads are measured at 1000 cycles, with the instrument used as a limit bridge.

INDUCTOR MEASUREMENTS: Inductors can be measured at 60 cycles 1000 cycles or 10,000 cycles upon their values.

Ranges:

L --	100HY to	1 HY	F -- 60 cycles
L --	1HY to	.01 HY	F -- 1,000 cycles
L --	.01HY to	.1mHY	F -- 10,000 cycles

ACCURACY: On the 10% position the components can be adjusted to within an accuracy of .5%.
Components to be adjusted to plus-minus 10% accuracy should be tested on the 20% position.

VOLTAGE APPLIED TO THE UNKNOWN: The voltage impressed across the unknown terminals varies with the absolute value of the unknown. The maximum voltage is 15 volts. The minimum voltage is .5 volts.

POWER SUPPLY: 105 to 125 volts, 50-60 cycles. The power consumption is 40 watts.

CONTROLS:

(a) Oscillator Controls -- Frequency selector switch and output level control.

(b) Bridge Controls -- Main percentage dial. "C balance," Range selector, 3 position switch (balance, 10% and 20%).

(c) Null Indicator Controls -- 5 step attenuator for the adjustment of the gain of the amplifier. Screw head adjustment for the zero of the vacuum tube volt meter.

VACUUM TUBES: All are supplied with the instrument.

1 - 6X5 1 - 6SL7 1 - 6J5 1 - 6V6 2 - 6SJ7

PORTABLE: Carrying cabinet of all metal construction.

NET WEIGHT: 15½ lbs.

DIMENSIONS: 10½" x 8-3/4" x 12".

C O N T R O L S

All the controls for the oscillator, bridge and amplifier are located on the front panel. These controls are:

OSCILLATOR:
Frequency: 3 standard frequencies are available: 50-60 cycles taken directly from the line, 1000 and 10,000 cycles generated by a tuned plate feed-back oscillator.

The frequencies, 1000 cycles and 10,000 cycles are accurate to within 10%. The 3 frequencies are selected by a rotary switch, marked "Oscillator Frequency." The oscillator level can be varied from zero level to maximum level by a special potentiometer marked "Oscillator Level."

AMPLIFIER:
The gain of the amplifier is adjusted by a five step potentiometer marked "Amplifier Attentuation."

VACUUM TUBE VOLTMETER:
A screw head adjustment for the zero setting of the voltmeter is located on the back of the chassis, and is available in the rear of the cabinet. The zero setting of the voltmeter should be made after the tubes have been permitted to warm up for a few minutes.

To adjust the zero setting of the voltmeter, set the oscillator level to zero, the frequency to 60 cycles and the amplifier attenuation to infinity. A special arrangement in the vacuum tube voltmeter protects the meter from overloading.

BRIDGE:

The bridge controls are "c balance" adjustment, the rotary switch marked "balance 10% and 20%," and the main percentage dial in the center of the panel.

The "c balance" control makes it possible to balance out capacitively the 2 arms of the bridge (X and Standard).

The rotary selector switch checks the performance of the instrument (balance position). The positions 10% and 20% correspond respectively to the comparison range between the unknown and the standard.

O P E R A T I N G I N S T R U C T I O N S

The instrument should be grounded in order to decrease the hum level of the amplifier. The ground connection should be made to the binding post located in the rear of the cabinet.

In some locations it may be necessary to reverse the power-line plug to obtain a minimum hum level. The following procedure should be used: Turn power on, set "Oscillator Level" control to 5, "Frequency" to 60 cycles, "Amplifier" control to - 20 db, and percentage switch to 10%. Rotate percentage knob until meter indicates 400 and by reversing power plug select the position in which meter reads 400 or lower.

When using the instrument as a comparison bridge, if the minimum reading is obtained when the pointer is to the left of zero (plus-minus R-L plus-minus- C) then the unknown is higher than the standard in the case of a resistor or an inductor, and lower than the standard in the case of a capacitor. If the minimum reading is obtained when the pointer is to the right of zero (-R-L plus-minus C) then the unknown is lower than the standard in the case of a resistor or an inductor and higher than in the case of a capacitor.

When using the instrument either as a comparison bridge or as a limit bridge, a preliminary check must be made to ascertain if the instrument is performing correctly. To accomplish this, allow the instrument to warm up for a few minutes, adjust the meter to zero, make sure the instrument is grounded, set the frequency selector switch at 60 cycles, set the oscillator level at 5, set the bridge selector switch at "balance," adjust the gain of the amplifier to about - 20db. (No leads should be connected to the terminals marked "X" and "standard" during this adjustment.) Turn the pointer. A very sharp zero indication should be obtained when the hair line of the pointer is on zero. To have a more accurate reading increase the gain of the amplifier until the desired sensitivity is obtained.

MEASUREMENT OF THE RESISTOR BY THE COMPARISON METHOD

Resistors are measured at 60 cycles, but low value resistors can also be measured at 1000 cycles. Connect leads to the terminals "Standard" and "X". Set the frequency at 60 cycles, set the oscillator level at 5, set the amplifier attenuator at -20db, set the pointer at zero, adjust the "c balance" until a minimum deflection of the meter is obtained. Increase the sensitivity by increasing either the gain of the amplifier or the level of the oscillator. The "c balance" is positively important when measuring high resistors. After this preliminary adjustment is made, connect the standard and the unknown to their respective terminals. Balance the bridge by moving the pointer either to the left or to the right. The exact percentage difference between the standard and the unknown is read on the main dial and is obtained when the meter indicates a minimum. When measuring high resistors special care must be taken to protect the instrument from external fields. For high resistor measurement, it is advisable to use a high oscillator level and a low amplifier gain, to decrease possible hum level.

CAUTION:

Resistors to be adjusted to plus or minus 10% accuracy should be tested on the 20% range, since the extreme position of the pointer at the 10% range is only accurate to within 0.5%. Resistors up to one megohm can be measured very accurately by the comparison method. In order to accurately measure resistors from one megohm to 5 megohms and higher, the limit bridge arrangement should be used.

USE OF THE INSTRUMENT AS A LIMIT BRIDGE

1. Check the instrument for correct performance (balance).
2. Adjust the "c balance" with leads connected to the terminals and range switch in 10% position.
3. Set the pointer exactly at zero.

Instead of connecting an unknown resistor, connect a standard resistor whose percentage difference from the standard is known. Adjust the oscillator level and amplifier gain until the deviation of approximately 2/3 of the scale is obtained on the meter. The limit bridge is then calibrated. Connect the resistor to the terminal X. All the unknown resistors that will cause a deviation of the meter equal or less than the present deviation are within the tolerance. The deviation of the meter can also be calibrated as a function of the percentage difference. In that case the instrument would not only indicate whether the unknown is within the tolerance but also by what percentage it differs from the standard. To accomplish this, obtain the deviation than move the pointer from the zero position slightly to the left or to the right,

when the deviation of the meter decreases its original position to the right of zero, then the unknown resistor is lower than the standard, if the pointer is to the left of zero than the resistor is higher than the standard.

CONDENSER MEASUREMENTS:

Condensers up to 10 microfarads are measured at 1000 cycles. Condensers of higher value should be measured at 60 cycles.

Set the frequency selector switch at 1000 cycles, disconnect all leads and check the instrument for balance. Then connect the leads that will be used, set the bridge selector switch at 10% and adjust the "C balance" accurately. After these two adjustments are made, the instrument is ready for use as a comparison bridge.

Condensers of less than 500 micromicrofarads should be measured with the instrument preset as a limit bridge.

When measuring condensers of small values, protect the bridge from external fields.

When adjusting condensers to within plus or minus 10% accuracy use the 20% position of the selector switch.

INDUCTOR MEASUREMENTS:

Inductors are measured at 60 cycles, 1000 cycles and 10,000 cycles, depending upon their values.

RANGES:

L= 100-H	F= 60 cycles
L= 1 H	F= 1000 cycles
L= .01H-.1 MH	F= 10,000 cycles

In measuring inductors the balancing procedures mentioned before (balance and "C" balance) must be repeated.

OPERATING NOTES

1. This instrument does not measure the "Q" of the inductor. A defective coil (one with shorted turns) or a defective Q can only be detected by the impossibility to obtain a minimum deviation, that is the balance condition.

2. The bridge does not measure the absolute value of the capacity but only compares impedances. Therefore, the power factor of a condenser cannot be measured.

3. The comparison bridge performs correctly only if the balance position minimum corresponds to the zero of the main dial. If the minimum is found to the left or to the right of the zero, then a resetting of the pointer is necessary. This may be accomplished by releasing the knob set screws until the knob assembly can be adjusted to the proper setting by slight pressure on the knob against the control stops.

PARTS LIST FOR COMPARISON & LIMIT BRIDGE

RESISTORS:

R-1	47K	-	1/2 w	-	10%
R-2	220 ohm	-	1/2 w	-	10%
R-3	100K	-	1/2 w	-	10%
R-4	220K	-	1/2 w	-	10%
R-5	250K	-	2 w	-	potentiometer
R-6	2.7K	-	1/2 w	-	10%
R-7	500 ohm	-	1 w	-	10%
R-8	10K	-	1 w	-	1%
R-9	10K	-	1 w	-	1%
R-10	5K	-	1 w	-	1%
R-11	5K	-	1 w	-	1%
R-12	1K wire wound potentiometer				
R-13	2.2 meg.	-	1/2 w	-	10%
R-14	1 meg.	-	1/2 w	-	10%
R-15	1 meg.	-	1/2 w	-	10%
R-16	220K	-	1/2 w	-	10%
R-17	1.5K	-	1/2 w	-	10%
R-18	1 meg.	-	1/2 w	-	10%
R-19	220K	-	1/2 w	-	10%
R-20	10K	-	1/2 w	-	10%
R-21	1 meg.	-	1/2 w	-	10%
R-22	1.5K	-	1/2 w	-	10%
R-23	1 meg.	-	1/2 w	-	10%
R-24	220K	-	1/2 w	-	10%
R-25	1 meg.	-	1/2 w	-	10%
R-26	470K	-	1/2 w	-	10%
R-27	22K	-	1/2 w	-	10%
R-28	5K	-	2 w	-	potentiometer
R-29	10K	-	1/2 w	-	10%
R-30	27K	-	1/2 w	-	10%
R-31	390K	-	1 w	-	10%
R-32	22K	-	1/2 w	-	10%
R-33	10K	-	1/2 w	-	10%
R-34	5K	-	2 w	-	potentiometer
R-35	50K	-	10 w	-	10%

CAPACITORS:

C-1	.02 mfd.	-	400V	-	paper
C-2	.004 mfd.	-	400V	-	mica
C-3	.1 mfd.	-	400V	-	paper
C-4	.01 mfd.	-	400V	-	mica
C-5	50 mfd.	-	25V	-	electrolytic
C-6	0-25 mmfd.	-	variable	-	"C Balance"
C-7	15 mmfd.	-	400V	-	mica
C-8	10-10 mfd.	-	450V	-	electrolytic
C-9	.01 mfd.	-	400V	-	mica
C-10	20-10-10 mfd.	-	25-450-450V	-	electrolytic
C-11	.01 mfd.	-	400V	-	mica
C-12	.01 mfd.	-	400V	-	mica
C-13	20-20-20 mfd.	-	450V	-	electrolytic

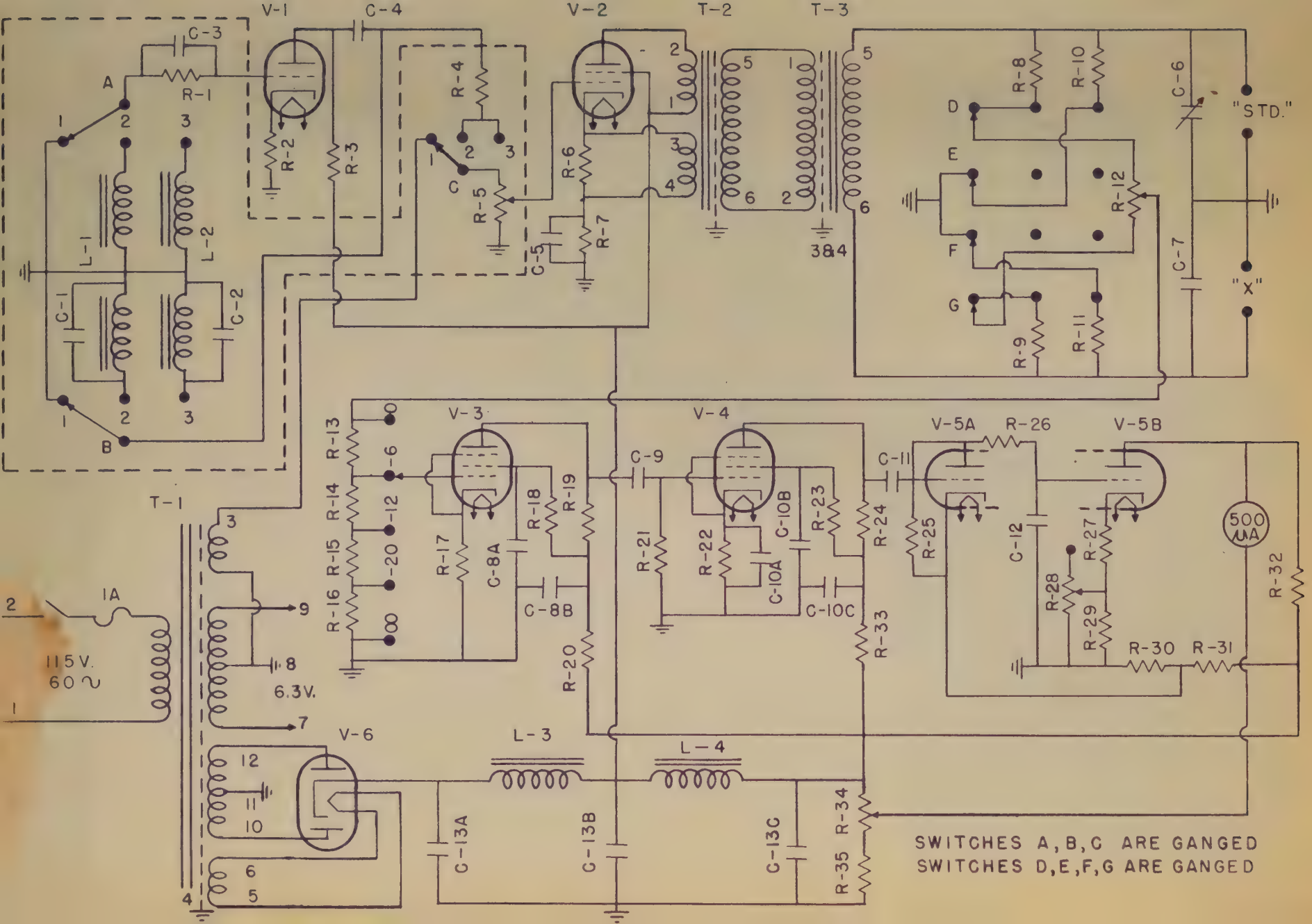
PARTS LIST FOR COMPARISON & LIMIT BRIDGE (CON'T.)

TRANSFORMERS:

T-1	-	Freed # 16893	-	Power Transformer
T-2	-	Freed # 16896	-	Isolation Transformer
T-3	-	Freed # 16897	-	Bridge Transformer

CHOKES:

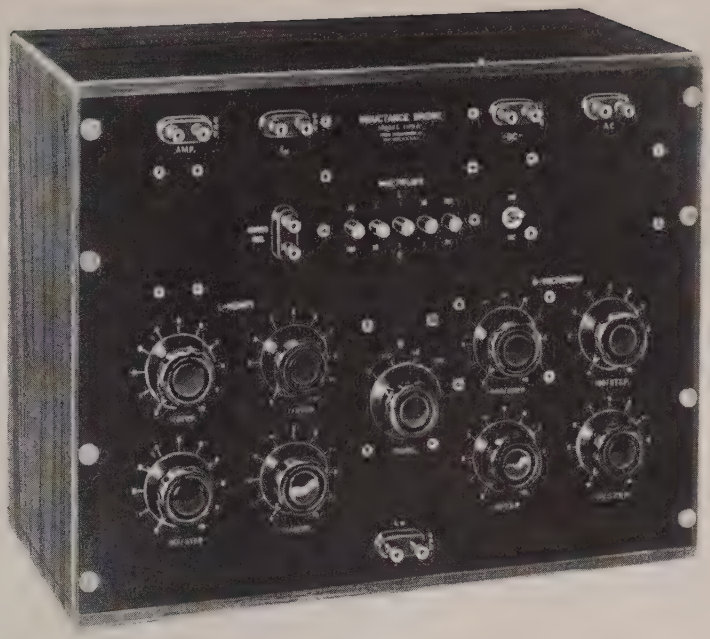
L-1	-	Freed # 16898	-	Oscillator Coil
L-2	-	Freed # 16899	-	Oscillator Coil
L-3	-	Freed # 16894	-	Filter Choke
L-4	-	Freed # 16895	-	Filter Choke


V-1
C-4
V-2
T-2
T-3
C-3
A
R-1
R-2
R-3
R-4
R-5
R-6
R-7
C-5
C-1
C-2
L-1
L-2
B
C
3&4
D
E
F
G
R-8
R-10
R-12
R-9
R-11
C-6
C-7
"STD."
"X"
V-3
V-4
V-5A
R-26
V-5B
T-1
R-13
R-14
R-15
R-16
R-17
R-18
R-19
R-20
C-8A
C-8B
C-9
R-21
R-22
C-10A
C-10B
C-10C
R-23
R-24
C-11
R-25
C-12
R-27
R-28
R-29
R-30
R-31
R-32
R-33
500 µA
1A
115V.
60 ~
6.3V.
V-6
L-3
L-4
C-13A
C-13B
C-13C
R-34
R-35
SWITCHES A, B, C ARE GANGED
SWITCHES D, E, F, G ARE GANGED

TYPE 1110-A

Incremental

INDUCTANCE BRIDGE



Uses: The Incremental Inductance Bridge is designed for measuring the inductance of Iron Core components at any frequency up to 10,000 cycles. Inductors can be measured with a superimposed direct current, therefore, the bridge will measure the incremental inductance of coils. The bridge can be used for determination of storage factor, "Q", either at a given frequency in function of the applied voltage or at a given voltage in function of the applied frequency. The bridge can be used by the manufacturers of iron core components, such as filter chokes, high Q coils, and iron core audio and supersonic frequency components. Due to its very wide inductance range the instrument can be used as a general purpose laboratory inductance bridge.

Description:

The bridge is a conventional Owen Bridge and measures inductors in terms of a standard condenser and resistor. Special circuit arrangements make it possible to superimpose a direct current through the unknown inductor and one arm of the bridge. The shielded built-in Isolation Transformer is capable of transferring high A.C. power from an A.C. line or audio frequency source to the arms of the bridge. All controls are available from the front panel. The switching from one range to another is accomplished by a five position push-button switch. The Inductor value is read directly on a four dial decade. The effective resistance of the inductance is measured in terms of its conductance and is read directly in mhos on a four dial decade.

Features:

The inductance and conductance are read directly on four dial decades. The direct reading feature avoids lengthy computation of inductance in terms of standard resistors and condensers. A very high inductance range, wide frequency range, and means of superimposing high values of direct current are the outstanding features of the bridge. The process of balancing the bridge is easy and rapidly convergent. The conditions of balance of the resistive and reactive component are independent. The balance does not depend on frequency of wave form. The value of inductance as read from the dial settings on the bridge is nominally independent of frequency and also independent of the storage factor Q of the inductor.

Specifications:

INDUCTANCE RANGES: One millihenry to one thousand henries in five ranges. Inductance values are read directly from a four dial decade and a multiplier switch. The last range may be extended to 10,000 henries through the use of an external resistance.

CONDUCTANCE RANGES: One micromho to one mho in five ranges, read directly from a four dial decade and a multiplier switch. This conductance represents the reciprocal of the A.C. resistance of the coil.

"Q" RANGE: "Q" is measured as the product of Inductance (L) and Conductance (G). The range of "Q" measured on this bridge is 0.5 to 100. Measurement of inductance is independent of the values of "Q".

ACCURACY: 1% through the frequency range from 60-1000 cycles, 2% for frequencies from 1000 to 10,000 cycles. This accuracy is decreased for extreme positions of the multiplier. Conductance measurements 5% from 60-1000 cycles.

FREQUENCY RANGE: The bridge is calibrated and adjusted at both 60 and 1000 cycles, but can be used at any frequency up to 10,000 cycles. Errors resulting from stray capacity increase with frequency. Coils having a high inductance should be measured at a low frequency to avoid resonance effect.

RANGE OF SUPERIMPOSED D.C.
On multiplier switch position L X 100, the D.C. is limited to 10 ma.
On the position L X 10, the D.C. is limited to 250 ma.
On all other positions, the D.C. can be one ampere maximum.

TEMPERATURE AND HUMIDITY EFFECTS: The readings of the bridge are unaffected by temperature and humidity variations of 65° F. to 95° F. and 0 to 90%.

MOUNTING: The bridge is supplied in a walnut cabinet or on special order for standard rack mounting.

DIMENSIONS:

	W	D	H
Rack:	19″	8″	14″
Cabinet:	21″	8″	14⅝″

NET WEIGHT: Rack — 37 lbs.; Cabinet — 48 lbs.

Printed in U.S.A.

FREED TRANSFORMER COMPANY, Inc.
Instruments Division
1718-36 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

TYPE 1150 UNIVERSAL BRIDGE

Uses: The type #1150 Universal Bridge is a general purpose audio frequency bridge. The bridge is used for inductance and capacitance measurements. It is the most useful communication laboratory bridge when used for measurements of reactive and resistive components, phase angles of two and four terminal networks, and input impedance of equalizers and filters at audio frequencies. The Universal Bridge is a valuable instrument for laboratory, production and acceptance testing of air and iron core inductors, transformers, paper and mica condensers.

Description:

The type #1150 Universal Bridge is composed of one fixed ratio arm, two variable arms and shielded transformer. A wide capacitance and inductance range is obtained by five ratio arms giving multiplying factors from 1 to 10,000 in decade steps. The ratio arm is controlled by a five position push-button switch. Both variable arms are composed of four precision decade resistors. By using an external condenser standard the bridge can be set up as a Maxwell Bridge, Hay Bridge, Resonance Bridge, Series Resistance Condenser Bridge, or Parallel Resistance Condenser Bridge.

The first three bridge combinations derive their greatest importance from the fact that they permit the measurements of inductance in terms of capacitance standards which are generally superior and more convenient than inductance standards. In the case of Series and Parallel Resistance Condenser Bridges, the unknown condenser is compared to a standard condenser. In order to maintain a high degree of accuracy, the two variable arms of the bridge are made of four dial decade resistors. The nominal value of the ratio arm and the two variable arms is chosen in a way to avoid laborious calculations. For all practical purposes the Universal Bridge has the rapidity and convenience of measurements of a direct reading instrument. A special shielded transformer makes the bridge balance independent of the type of generator and detector used. The reading of the bridge is independent of its surroundings and the position of the operator. To achieve this, the bridge is very carefully shielded, and the shield connected to ground.

Furthermore, all variable controls have their shafts grounded. The two variable arms of the bridge are accessible from the front panel. The range of the bridge can be extended by using external standards. The bridge is calibrated for an accuracy of ½% at 1000 cycles. The bridge can be used throughout the frequency spectrum from 20 cycles to 20,000 cycles. Due to the distributed capacities of the arms of the bridge the accuracy of the bridge is decreased above 10,000 cycles. The accuracy of the bridge is decreased for the largest value of the ratio arm.

Features:

The Universal Bridge offers a variety of five possible bridge circuits. A wide range of capacitance, inductance, impedance, and phase angle measurement can be made throughout the frequency spectrum from 20 cycles to 20,000 cycles.

By using decade resistors in the variable arms the unknown can be measured with four significant figures.

Operation is simple and both terminals and controls are arranged for convenience and ease of measurements.

Specifications:

FREQUENCY RANGE: The bridge can be used at frequencies from 20 cycles to 20,000 cycles.

ACCURACY: All resistors of the bridge arms are adjusted to 0.1%. The absolute accuracy of measurement will depend upon the accuracy of standards used.

INDUCTANCE RANGE: The bridge will measure inductance of coils from 0.1 mh to 1000 henries with an accuracy of 0.5% at 1000 cycles.

CAPACITANCE RANGE: Condensers from .001 mf to 1 mf can be measured to within 0.5% at 1000 cycles. Condensers below .001 mf should be measured by the substitution method.

MOUNTING: The bridge is supplied in a walnut cabinet or on special order for standard rack mounting.

DIMENSIONS:

W	D	H
19″	x 8½″	x 12″

WEIGHT: 32 lbs.

Printed in U.S.A.

FREED TRANSFORMER COMPANY, Inc.
Instruments Division
1718-36 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

FREED
No 1020-B
MEGOHMMETER

Uses

The Freed Type 1020-B Megohmmeter is a self-contained and a-c operated instrument equally useful in the laboratory or for production testing of the leakage resistance of insulation materials, condensers, cables, motors and transformer windings.

Description

The instrument is a direct reading precision balanced electronic ohmmeter with a 500 volt d-c test potential included as a part of the unit. The insulation resistance is measured in six overlapping ranges and is indicated by a four inch meter, protected against overload. A relay, operated from the front panel disconnects the high voltage from the test terminals and eliminates all danger of shock due to exposed high potential. In the stand-by position (when push-button is released) a resistance between the high voltage terminal and chassis (ground) discharges condenser under test, eliminating danger of shock when disconnecting the component.

Resistance values indicated directly on a four inch meter which is protected against overload.

Rapid and safe to use, test voltage removed from terminals and capacitive component discharged to ground in all positions of multiplier switch.

Low resistance in series with component under test provides very short charging time for even the very largest capacitors. Calibration position provided to check accuracy of 500 volts d-c potential. 500 volt test supply electronically regulated.

Description

RANGE: 1 megohm to 2,000,000 megohms in six overlapping ranges selected by a multiplier switch.

SCALE: Resistance is indicated on easy to read four inch meter which is protected against overload.

ACCURACY: Plus or minus 3% on resistance values up to 100,000 megohms; plus or minus 5% from 100,000 to 2,000,000 megohms.

VOLTAGES ON UNKNOWN: The voltage applied to the unknown terminals is 500 volts d-c and is independent (less than 1%) of the value of the unknown.

STABILITY: Line voltage variations from 105-125 volts will cause less than 2% variation in the meter reading.

TERMINALS: Four terminals are provided, two for connecting the unknown, one guard and one ground. As a safety feature, when pushbutton is released, the test voltage is removed from the terminals. This permits connections to be made without danger of shock in all positions of the selector switch.

CONTROLS: A range selector, zero adjust and calibration switch. Zero adjust control for setting meter scale to infinity. Pushbutton switch for activating relay which applies test voltage to terminals and when released discharges capacitive component of the unknown. A.C. on-off switch.

TUBES:

1 — 6C4	1 — 2X2-A
1 — 6AU6	1 — 6X4
1 — 12AU7	1 — OB2
1 — 5651	

POWER SUPPLY: 105-125 volts A.C. 50-60 cycles 30 Watts.

CABINET: Portable and of all metal construction.

DIMENSIONS: 9½" x 10½" x 8".

NET WEIGHT: 18 pounds.

ACCESSORIES SUPPLIED: Test leads with interchangeable tips consisting of color coded test prods and alligator clips.

FREED TRANSFORMER COMPANY, Inc.
Instruments Division
1718-36 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

FREED COMPARISON and LIMIT BRIDGE TYPE NO. 1010

Uses

This instrument is a comparison and limit bridge for use in both laboratory and production testing of resistors, condensers and inductors. The manufacturer of these components can use it for production tests, the user for incoming inspection and acceptance tests. The instrument is particularly useful for laboratory work (bridge or filters) where very accurate components are required.

Features

For precision and production testing, the bridge has many advantages. Power line operation and the visual indicator make the instrument completely self-contained. It can be used in noisy locations. Its small size and light weight permit the instrument to be moved easily and to be set up wherever necessary.

Description

The instrument is composed of an oscillator, a bridge and an amplifier. The oscillator feeds the frequencies into a bridge consisting of 2 fixed resistors, the unknown impedance and the standard. A variable resistor connected between the 2 fixed resistors makes it possible to read the percentage difference between the unknown and the standard, on a specially calibrated dial. A high gain amplifier indicates the balance of the bridge. The general method of testing is the comparison of an unknown component with a standard component of the same type. Accurate percentage measurements are obtained by the use of precision components in the arms of the bridge. The use of high gain amplifier and adequate internal shielding assures a very sharp and distinct balance.

A visual null indicator, consisting of a meter used in connection with the high gain amplifier makes it possible to use the No. 1010 Bridge as a precision limit bridge in production testing.

Specifications

FREQUENCY: Three frequencies are available: 50 to 60 cycles, 1000 cycles, and 10,000 cycles.

The 50 or 60 cycles are taken from the line.

The 1000 and 10,000 cycles are generated by an oscillator and are accurate to within 10%.

RANGE: Two comparison ranges are provided: 10% and 20%. They are selected by a rotary switch. In the 10% position the percentage is read directly on a calibrated dial. In the 20% position the reading of the dial is multiplied by two.

RESISTOR MEASUREMENTS: Resistors from 10 ohms up to 1 megohm are measured by the comparison method at 60 cycles. Resistors of greater value than 1 megohm can be measured by using the instrument as a limit bridge.

CONDENSER MEASUREMENTS: Condensers from 500 micromicrofarads up to 10 microfarads are measured by the comparison method at 1000 cycles. Condensers above 10 microfarads are measured by the comparison method at 60 cycles.

Small condensers 500 micromicrofarads to 25 micromicrofarads are measured at 1000 cycles, with the instrument used as a limit bridge.

INDUCTOR MEASUREMENTS: Inductors can be measured at 60 cycles, 1000 cycles or 10,000 cycles depending upon their values.

Ranges:

L—100Hy to 1 Hy	F— 60 cycles
L— 1Hy to .01 Hy	F— 1,000 cycles
L— .01Hy to .1m Hy	F—10,000 cycles

ACCURACY: On the 10% position the components can be adjusted to within an accuracy of .5%.
Components to be adjusted to ± 10% accuracy should be tested on the 20% position.

VOLTAGE APPLIED TO THE UNKNOWN: The voltage impressed across the unknown terminals varies with the absolute value of the unknown. The maximum voltage is 15 volts. The minimum voltage is .5 volts.

POWER SUPPLY: 105 to 125 volts, 50-60 cycles. The power consumption is 40 watts.

CONTROLS:

(a) Oscillator Controls—Frequency selector switch and output level control.

(b) Bridge Controls—Main percentage dial. "C balance," Range selector, 3 position switch (balance, 10% and 20%).

(c) Null Indicator Controls—5 step attenuator for the adjustment of the gain of the amplifier. Screw head adjustment for the zero of the vacuum tube volt meter.

VACUUM TUBES: All are supplied with the instrument.
1—6X5 1—6SL7 1—6J5 1—6V6 2—6SJ7

PORTABLE: Carrying cabinet of all metal construction.

DIMENSIONS: 10½" x 8¾" x 12".

NET WEIGHT: 15½ lbs.

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MP MASTER
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